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# Calc-alkaline magmatism and the origin of the Earth's first continental crust

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Formation of the Earth's first (i.e. Archaean) continental crust is usually attributed to conditions and processes that were characteristic only of the early Earth and very different from those prevailing today. However, a consideration of Archaean TTG granitoids and their compositional characteristics, and of new and previously-published experimental data, shows that this may not have been the case. Like many modern arc-magmas, such as at Mt. Taranaki (New Zealand), Archaean TTGs follow calc-alkaline fractionation trends that can be attributed to a combination of parent magma characteristics and low-pressure (≤ 0.5 GPa) crystal-fractionation involving the precipitation and removal of plagioclase + pyroxene(s) ± amphibole + magnetite from primitive parent magmas. Although TTGs are characteristically depleted in heavy rare earths (HREE), these depletions do not correlate with standard indices of magma fractionation. Consequently, they are unlikely to reflect the involvement of garnet during progressive, high-pressure (≥ 1.5 GPa) melting of a basaltic proto-crust, as has commonly been assumed. Instead, it is more probable that the HREE depletions and other distinctive incompatible element characteristics of TTGs were inherited from primitive parent-magmas (and/or source rocks) that resembled modern high-Mg basalts (with which TTGs share a high degree of compositional continuity).